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ABSTRACT

This course familiarizes students with punched-card and electronic data processing terminology, the cycle, the basic operations, and their relationship to these two systems. It includes a familiarization with the various devices, equipment, media, and typical business applications for each system; it also includes an introduction to languages used in data processing and job specifications. Included are the performance objectives, course content outline, suggested teaching procedures, evaluative instruments used, and resources for students and teachers. Appended are student computer activities and suggested test items. (Author/BP)

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AUTHORIZED COURSE OF INSTRUCTION FOR THE QUINMESTER PROGRAM

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MODERN BUSINESS DATA PROCESSING

Business Education--7743.02 (Now: 7628.02)

DADE COUNTY PUBLIC SCHOOLS

DIVISION OF INSTRUCTION • 1971

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MODERN BUSINESS DATA PROCESSING

7743.02 (New: 7628.02)

Business Education

Written by Barbara Smith
And Approved by the Business Education Steering Committee
For Quinmester Courses

for the

DIVISION OF INSTRUCTION
Dade County Public Schools
Miami, FL 33132
1973

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TABLE OF CONTENTS

I. COURSE TITLE 1
1
II. COURSE NUMBER 1

III. COURSE DESCRIPTION 1
Synopsis 1
Textbook 1
Occupational Relationships 1
Rationale 1

IV. COURSE ENROLLMENT GUIDELINES 1
Student Classification 1
Prior Experience Needed 1
Pretest 1

V. COURSE OF STUDY PERFORMANCE OBJECTIVES 2

VI. COURSE CONTENT 3
Equipment and Supplies 3
Curriculum 3

VII. SUGGESTED PROCEDURES, STRATEGIES, AND LEARNING ACTIVITIES 4
Course Strategy and Method 4
Activities 4
Simulation 5

VIII. EVALUATIVE INSTRUMENTS 5

IX. RESOURCES FOR STUDENTS 6
Textbooks, Workbooks and Practice Sets 6
Booklet 7

X. RESOURCES FOR TEACHERS 7
Books 7
Wall Chart 7
Sources of Films 7

APPENDIX 9

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I. COURSE TITLE--MODERN BUSINESS DATA PROCESSING

II. COURSE NUMBER--7743.02 (New: 7628.02)

III. COURSE DESCRIPTION

A. Synopsis
Familiarizes students with punched-card and electronic data processing terminology, the cycle, the basic operations, and their relationship to these two systems; includes a familiarization with the various devices, equipment, media, and typical business applications for each system; also includes introduction to languages used in data processing and job specifications.

B. Subject Status--Elective

C. Textbook
One or more of the state adopted textbooks and/or one of the department's choosing; in most instances the same book used for Concepts of Business Data Processing, the prerequisite quinmester course. (Add recommended text-workbook, Computers, People, and Data.)

D. Occupational Relationships

Clerk	Data processing workers:
Clerk-typist	operator of equipment
Typist	programmer
Stenographer	systems analyst
Secretary	
Business Manager	
Bookkeeper	
Accountant	
Tabulating equipment worker	

E. Rationale
Hardware is not required in the classroom although at least a card punch machine would enhance learning. Films and field trips could suffice for an introduction to hardware. These activities should be included even though hardware is accessible in the school because students need to gain a concept of a wide range of types of equipment.

IV. COURSE ENROLLMENT GUIDELINES

A. Student Classification--Co-educational, 11th or 12th grade preferred.

B. Prior Experience Needed
The student should have attained the objectives of Concepts of Business Data Processing prior to enrollment in this course. It is recommended that the student continue to Math 5281.15, Use of the Computer in Problem Solving.

C. Pretest
This test should be used to determine if the student has attained the objectives of the prerequisite course, particularly the concepts

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IV. COURSE ENROLLMENT GUIDELINES, Continued

of the data processing cycle and basic data processing operations. It should help the teacher determine not only if the individual student is ready for the course but also the extent of the need for review of the major concepts covered in the course, Concepts of Business Data Processing.

A pretest could be administered to a student who feels he has attained the objectives of the course as given. Should such a student successfully complete the pretest, he could choose to enroll in the quinmester course, Math 5281.15, Use of the Computer in Problem Solving.

V. COURSE OF STUDY PERFORMANCE OBJECTIVES

Upon successful completion of the course, students will be able to--

1. list chronologically five to ten given events dealing with the development of electronic programmable data processing ideas and tools;

2. for a given business problem, plot the necessary fields on a Hollerith card using a given basic coding system for coding the information;

3. lay out a program card to do the job on the keypunch machine for a given problem keypunch exercise;

4. choose a single business problem, using it to describe the flow of data through a tabulating system in terms of the data processing cycle and seven basic operations of data processing;

5. construct a flowchart for a given simple problem using at least four accepted flowcharting symbols to illustrate the steps necessary to accomplish the job;

6. write a list of instructions (program) for computer use for a given flowcharted problem;

7. convert at least three 3-digit numerals from the binary numbering system to the decimal numbering system and three from the decimal numbering system to the binary numbering system;

8. code a given simple numeric and alphabetic expression in binary coded decimal form;

9. choose at least three media from a given list of I/O media and describe them in terms of characteristics and use; and

10. list and give an argument suposrting the implications of at least two advantages, disadvantages, and present and/or future effects of modern data processing.

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VI. COURSE CONTENT

A. Equipment and Supplies
   1. Basic needs
      a. Desk
      b. Textbook or practice set or teacher-created activities
      c. Writing instruments for note taking
   2. Supplementary needs
      a. Overhead projector and screen
      b. Transparancies of ADP machines and supplies
      c. Bulletin board examples of machines and supplies
      d. Tabulating equipment
      e. Hollerith cards
      f. Flowcharting templates
      g. Charts and other visual aids for numbering systems
      h. Rulers
      i. Charting paper

B. Curriculum
   1. Data processing cycle and basic operations review
   2. Tabulating equipment system
      a. History
      b. Hollerith card
         (1) Format
         (2) Coding
         (3) Fields
         (4) Uses
            (a) Checks
            (b) Coupons
            (c) Credit slips
            (d) Payment notices
            (e) Student records
            (f) Inventory records
            (g) Other
      c. Keypunch machine
         (1) Operation
         (2) Program card
      d. Verifier
      e. Sorter
      f. Collator
      g. Tabulator
      h. Business applications
   3. Electronic programmable computers
      a. History
      b. Types
         (1) Analog
         (2) Digital
      c. Input
         (1) Flowcharting
         (2) Languages
            (a) Binary
            (b) Binary coded decimal
            (c) Programming
            (d) Other languages

VI. COURSE CONTENT, Continued

(3) Media
(a) Punched cards
(b) Magnetic tapes
(c) Magnetic ink characters
(d) Optical scanners
(e) Typewriters
(f) Disks

d. Central processing unit
(1) Memory storage
(2) Control
(3) Arithmetic and Logic

e. Output
(1) Punched cards
(2) Magnetic tape
(3) Magnetic disks
(4) Printed material
(5) Other

4. Implications of modern data processing
a. Advantages
b. Disadvantages
c. Effects
(1) Present
(2) Future
(3) Job opportunities

5. Job descriptions in the area of business data processing

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VII. SUGGESTED PROCEDURES, STRATEGIES, AND LEARNING ACTIVITIES

A. Course Strategy and Method

Throughout the course, the relationship between the different systems and the flow of data in terms of the data processing cycle and the seven basic operations are stressed. Lecture, demonstration, and audio-visual explanation followed by practice sessions seem good learning techniques for coding and machine parts and functions where equipment is lacking.

Ideally, a laboratory with all the machines of a tabulating equipment system would be the best way to learn data flow in this system. As this is rarely possible, the use of the overhead projector and teacher-student designed simulations can help students see and understand the basic operations. If at all possible, at least one card-punch machine should be available for use.

B. Activities

In introducing the Hollerith punched-card, students can find many application examples from life about them. Blank cards could be used to learn to code data by marking appropriate areas with pencil. Activities such as student coding of answers to questions and exchanging cards for interpretations of answers provide learning in a game atmosphere.

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Have each student write a job description of the data processing worker that appeals most to him. Include work conditions, qualifications, pay, preparation available in high schools, grooming, and advantages and disadvantages of the job.

Invite one or more speakers to discuss phases of electronic data processing after students have had an opportunity to gain a basic familiarity with it.

A field trip to an EDP installation (late in the course) in groups of not more than 20 to view more sophisticated equipment than is available in the local school will help students realize the need for much more training if they want an EDP occupation.

C. Simulation

Sorting problems, both numeric and alphabetic, can be successfully learned through the use of a simulated sorter. Each student marks on a blank Hollerith card whatever numeric or alphabetic material is assigned. Each student's material is unique. The sorter is represented by 13 small cartons (shoeboxes perhaps) set up in a row as pockets on the sorter. The students line up and each one sorts on the extreme righthand column of the field, dropping his card in the appropriate carton as he passes by the "sorter." After the first pass, one student is the operator and removes the cards from the pockets in proper order and places them in the hopper. The students file by the hopper ready to sort the second column of the field. Each one takes the bottom card from the hopper because the cards feed through face down. The process is repeated as many times as there are columns in the field on the card. The sequence of the cards may be listed on the chalkboard in order to give the students an idea of what is happening. The collator may be simulated in a like manner.

Learning computer concepts through the use of a desktop computer is an ideal situation as students have actual hands-on experience with the opportunity to see both the true capabilities and limits of computer data processing and the importance of the human contribution in its success or failure.

An activity simulating computer data processing requires a great deal of advance preparation but seems to be a valuable learning experience in a hands-on technique. One such project is included in the appendix.

VIII. EVALUATIVE INSTRUMENTS

Practice sets and workbooks usually have suggested techniques for evaluation together with tests for covering the material.

Objective type tests, multiple-choice and fill-in, can be used to test factual learning of codes, flowcharting, symbols, and machine functions and uses.

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VIII. EVALUATIVE INSTRUMENTS, Continued

Understanding of concepts, data flow, etc., seems best evaluated by means of case problems and essays.

The pretest and posttest should measure achievement in each performance objective of this course.

Several suggested test items are included in the appendix.

IX. RESOURCES FOR STUDENTS

A continuation of the resources listed in Concepts of Business Data Processing plus the following:

A. Textbooks, Workbooks and Practice Sets

Bux, William E. Key-Punch Training Course. 2nd ed. (Practice Set). Cincinnati: South-Western Publishing Co.

Clow, Cletus A.; MacDonald, Robert D.; Freeman, M. Herbert; Hanna, J. Marshall; and Kahn, Gilbert. Punched-Card Data Processing System. Practice Set for Accounting 10/12 Part IV. (Sales and Payroll Procedures). (Not limited to students with bookkeeping background.) New York: Gregg Division of McGraw-Hill Book Co., 1970.

Farina, Mario V. Computers, A Self Teaching Introduction. Englewood Cliffs: Prentice-Hall, Inc. 1970.

Hanson, Peggy. Keypunching, 2nd ed. (Text-workbook). Englewood Cliffs: Prentice-Hall, Inc. 1970.

Murach, Mike. Principles of Business Data Processing. Chicago: Science Research Associates, Inc., 1970.

Pactor, Paul and Kargilis, George. Card-Punch Simulation Operation. (Text-workbook). New York: Gregg Division of McGraw-Hill Book Company, 1968.

Payne, E. A. and Payne, W. F. Easily Applied Principles of Keypunching. (Text-workbook) Englewood Cliffs: Prentice-Hall, Inc., 1970.

Prosser, W. Robert and Beldecos, Helen J. Keypunch Practice. (Text-workbook). Baltimore: H. M. Rowe Company, 1967.

Prosser, W. Robert and Beldecos, Helen J. Keypunch Projects. (Text-workbook). Baltimore: H. M. Rowe Company, 1971.

SRA Programmed Instruction Series, in Data Processing. Computing Systems Fundamentals--Techniques. Science Research Associates, Inc. 1969.

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IX. RESOURCES FOR STUDENTS, Continued

Wood, Merle W. Computers, People and Data. (Text-workbook). Cincinnati: South-Western Publishing Co., 1972.

B. Booklet

Educational Development. Add two booklets: Book 2, What is Binary Arithmetic?, deals with mechanical addition, counting the relation of the decimal system to binary arithmetic, and various types of computer memory. Book 3, What Is a Computer?, discusses input and output as well as various components of computer hardware.

X. RESOURCES FOR TEACHERS

A continuation of those listed in Concepts of Business Data Processing plus the following:

A. Books

Crowley, Thomas H. Understanding Computers. New York: Gregg Division of McGraw-Hill Book Company, 1967.

Rath, Gustave J. Punched Card Data Processing. Chicago: Science Research Associates, Inc., 1961.

Sanders, Donald H. Computers in Business, An Introduction. New York: Gregg Division of Mc-Graw Hill Book Company, 1968.

Saxon, James A. and Steyer, Wesley W. Basic Principles of Data Processing, 2nd ed. Englewood Cliffs: Prentice-Hall, Inc., 1970.

B. Wall Chart

IBM Punched Card Visual Aid, South-Western Publishing Co., 5101 Madison Road, Cincinnati, Ohio 45227. 19" x 40" chart, Free.

C. Sources of Films

DEVRY: DeVry Technical Institute, 4141 Belmont Avenue, Chicago, Illinois 60641

IBM: International Business Machines, Inc., Contact Local IBM Representative

Association Instructional Materials, 37 Madison Avenue, New York, N. Y. 10017

Recognition Equipment, Inc., 815 Connecticut Avenue, N. W., Washington, D. C.

Stromberg-Carlson Corporation, Post Office Box 2449, San Diego, Calif. 92112

X. RESOURCES FOR TEACHERS, Continued

SDC: System Development Corp., 2500 Colorado Avenue, Santa Monica, Calif., 90406.

Union Carbide Nuclear Co., Industrial Relations Division, P. O. Box 1223, Paducah, Ky.

UNIVAC, Division of Sperry Rand Corporation, Advertising & Sales Promotion Department, 1290 Avenue of Americas, New York, New York 10019

UCLA, University of California Extension Media Center, Media Distribution, 2223 Fulton Street, Berkeley, California 94720

USAF, U. S. Air Force Film Library, 8900 South Broadway, St. Louis, Missouri 63125

Western Electric (Consult Local Business Office of Telephone Company)

APPENDIX

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STUDENT COMPUTER ACTIVITY

The following activity is for learning how the computer works.

A statement of the program is given to the students. (See sample on next page.) The fields are set up on the card in a class or group activity after discussion as to what information is needed to solve the problem.

Because exercises in flowcharting should have been covered before starting this activity, the flowchart for the program can be accomplished by groups working together with a final production of an accepted class flowchart. The teacher will have to step in at this point if the flowchart does not follow the steps as planned for this particular program. (See suggested flowchart on a following page.)

Three types of cards will be used in this activity. (1) Hollerith data cards with fields marked by students; (2) instruction cards prepared by the teacher; and (3) a blank 3 by 5" memory card used as the activity progresses.

At least three punched (or pencil marked) cards should be set up for the input data to be used when the students act as a computer and work the problem. Grades on the cards should be varied with some blank spaces left in at least one card for missing grades to test missing grade processing. (See sample data cards on a following page.)

Depending on the abilities of the students, writing of the program may be done as a class activity or the program may be previously duplicated for discussion. As students may find it difficult to anticipate the bugs, thus making working the computer with a faulty program less than a learning activity, it might be best to supply the already debugged program at this point. (See sample Program for Averaging Grades on a following page.)

Following a discussion of the program, an explanation of how the students will act as a computer should follow. Students are likely to be confused at first and during the first loop it will be necessary to direct most of the students in their parts. By the second loop, they will have caught on, and by the third loop will have become a rapidly-working computer. Sometimes it is a good idea to change student instructions to involve more students in the repeated instructions of the loop.

INSTRUCTIONS FOR BEING A COMPUTER

Each instruction as shown on the Sample Program for Averaging Grades is pre-printed on a separate card. Starting at one side of the room, each student gets one instruction card with one instruction on it (numbered in sequence). The data cards (prepared by the students) are stored on the teacher's desk. As soon as the teacher has stored the instruction and data cards in the above manner, the program begins. The first instruction is followed by the student holding that instruction and it

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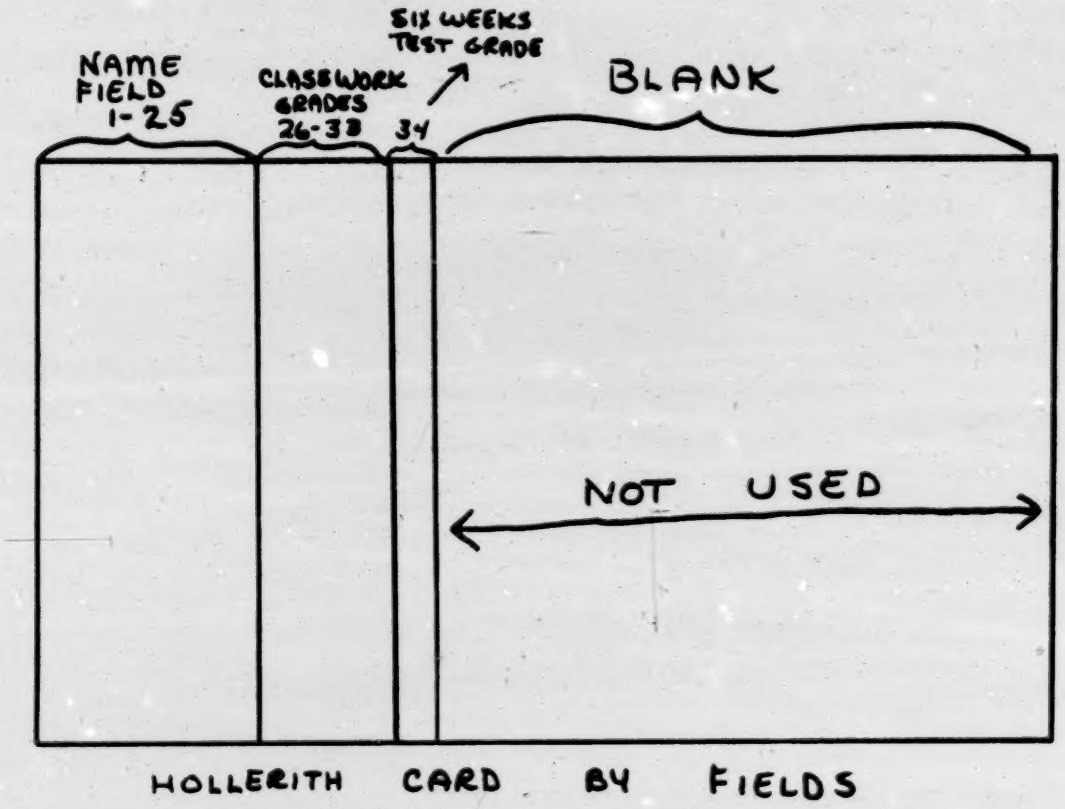
must be followed exactly as written; nothing added, nothing taken away. When the instruction is completed, the student holding instruction card number 2 follows his instruction exactly as written. Each instruction follows in sequence. Instruction 4 is followed by that student even the first time when there is no information to be erased. This points out the blind instruction-following of a computer.

Instruction 5 is difficult and the student will need help in following it. The next student after the student having received instruction 21, acts as the first place for storing data and becomes seat 1 of instruction 5 and so on until instruction 5 stores all the data on the first card from the teacher's desk.

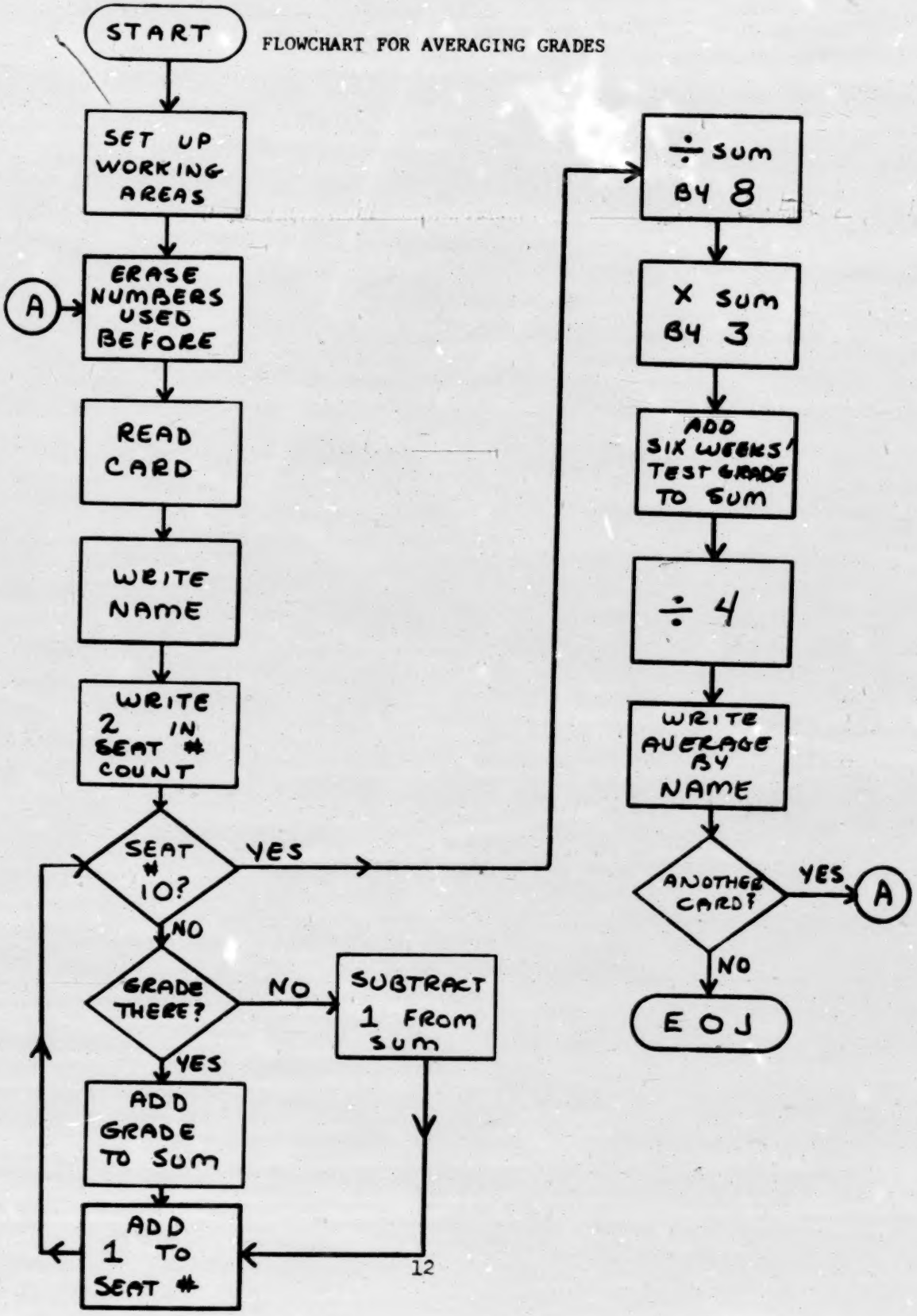
The rest of the instructions are followed in sequence <u>exactly as written</u>; <u>no more, no less</u>.

SAMPLE PROGRAM STATEMENT

Program: Students assume 8 grades for a six-week period (6 for classwork and 2 identical grades for the six-weeks' test) A=4, B=3, C=2, D=1, F=0. Subtract 1 for each missing (blank) grade. Add grades, divide by 8 to get an average. Classwork average = 3/4
Six-weeks'test = 1/4 } 6-weeks' grade



FLOWCHART FOR AVERAGING GRADES



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SAMPLE PROGRAM FOR AVERAGING GRADES

INSTRUCTION NUMBER — INSTRUCTIONS FOR BEING A COMPUTER

1. Mark off space on the chalkboard to write out a student's name and average. Label it REPORT AREA.

2. Mark off space on the chalkboard to add grades. Label it SUM.

3. Mark off space on the chalkboard to keep seat number count. Label it SEAT NUMBER.

4. Erase any numbers and the student name and grades on the chalkboard.

5. Store information on a blank 3" by 5" memory card in seats 1-10 by telling each seat to copy information on the card in the following manner:

Seat 1 copies the name	Seat 6 copies the fifth grade
Seat 2 copies the first grade	Seat 7 copies the sixth grade
Seat 3 copies the second grade	Seat 8 copies the seventh grade
Seat 4 copies the third grade	Seat 9 copies the eighth grade
Seat 5 copies the fourth grade	Seat 10 copies the six weeks' test grade(s)

6. Tell seat 1 to write the student name on the chalkboard in the REPORT AREA.

7. Write the number 2 in the SEAT NUMBER area on the chalkboard.

8. If SEAT NUMBER is 10, tell instruction 15 to go next; otherwise, the next instruction proceeds.

9. Ask SEAT NUMBER on board if it has a grade. If there is no grade, tell instruction 13 to go next. If the SEAT NUMBER on the board has a grade, tell the next instruction (10) to go next.

10. Tell SEAT NUMBER on the board to add its grade to SUM area on the board.

11. Add 1 to SEAT NUMBER area on the board.

12. Tell instruction 8 to go next.

13. Subtract 1 from SUM area on the chalkboard.

14. Tell instruction 11 to go next.

15. Divide the SUM area on the chalkboard by 8.

16. Multiply SUM area by 3.

17. Tell SEAT NUMBER 10 to add its grade to SUM area.

18. Divide SUM by 4.

19. If SUM area is: 1 - 1.5, write D next to the name in REPORT
1.6 - 2.5, write C next to the name in REPORT
2.6 - 3.5, write B next to the name in REPORT
3.6 - 4.0, write A next to the name in REPORT

20. If there is another card, tell instruction 4 to go next; otherwise, say "I PASS."

21. Stop the job by collecting the instructions and erasing the chalkboard.

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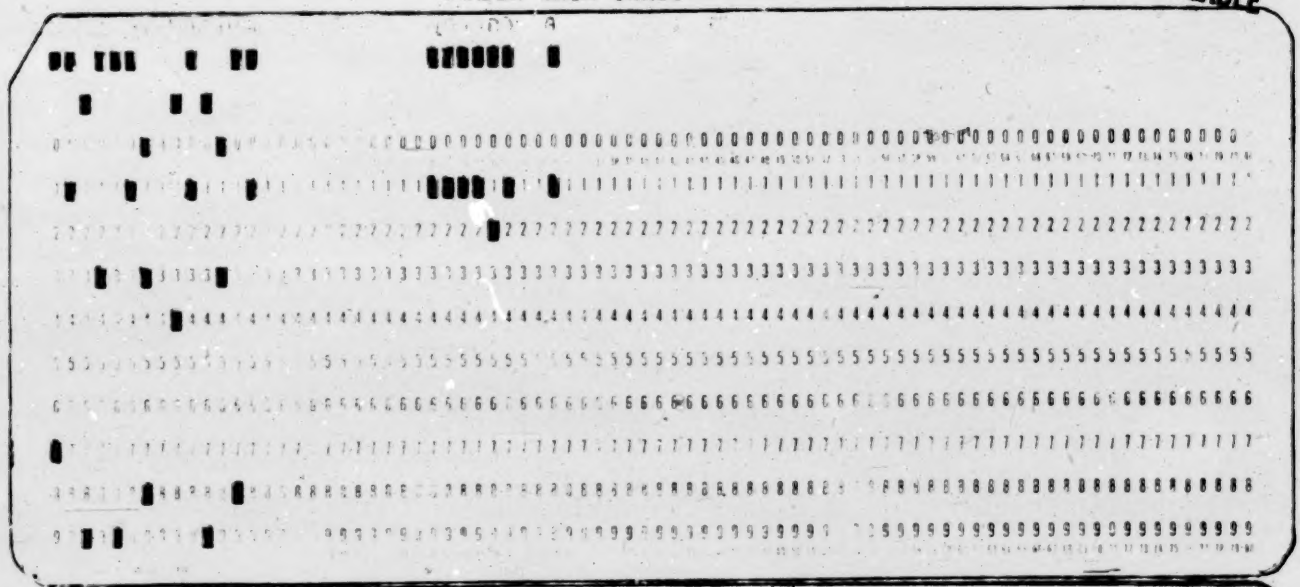
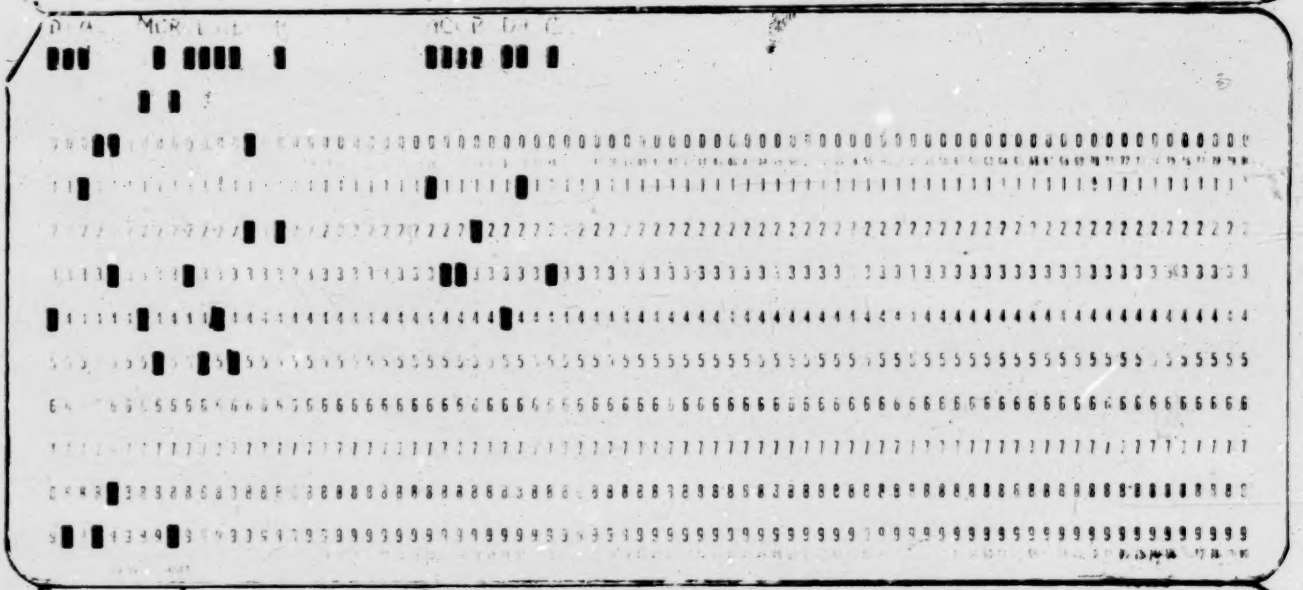
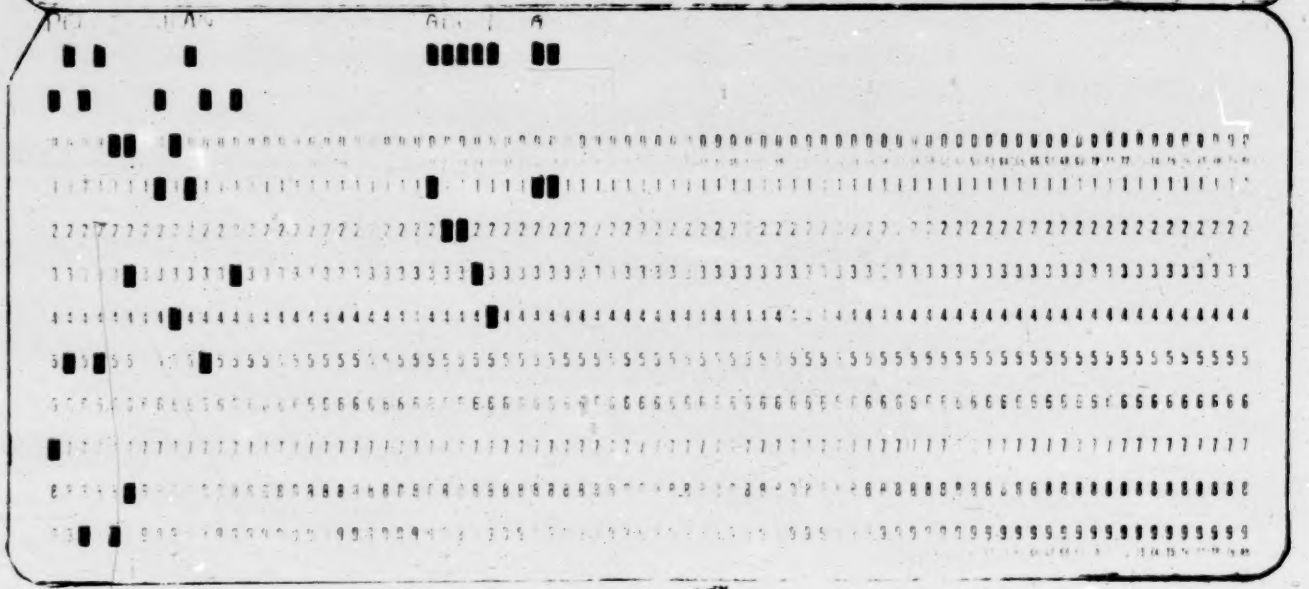
SAMPLE DATA CARDS







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SUGGESTED TEST ITEMS

I. OBJECTIVE

A. Multiple-Choice

__ 1. Data processing (a) can only be done by a skilled programmer; (b) is office work done on a business machine; (c) is the handling of information.

__ 2. The number of columns required to punch the number 6875 on an IBM card is (a) one; (b) four; (c) left up to the keypunch operator.

__ 3. Blank spaces may not be left when punching in a (a) number field; (b) alphabetic field; (c) both alphabetic and numeric fields.

__ 4. The number of columns required to separate information recorded in two adjacent fields is (a) 2; (b) 1; (c) 0.

__ 5. A basic tabulating system may consist of (a) a keypunch machine, a verifier, and a ten-key adding machine; (b) a keypunch machine, a sorter, and a rounder; (c) a keypunch machine, a sorter and a tabulating machine.

__ 6. A source document is (a) one medium for input; (b) the second place the information is recorded; (c) is unimportant except to the seller.

__ 7. Digital computers are more often used than analog computers for (a) measuring viscosity; (b) payroll work; (c) kinetic ink characters.

__ 8. A standard language used in coding programs for computers is (a) MICR; (b) COBOL; (c) Hexidecimal.

__ 9. A system of numbering that consists of 4 binary numbers for each individual digit in a decimal number is called (a) binary numbering system; (b) binary coded decimal; (c) Fortran.

__ 10. Basic units of a computer network usually include all but which one of the following? (a) CPU; (b) storage; (c) ENIAC; (d) control unit.

__ 11. A data storage medium which is not used in electronic data processing is which one of the following: (a) punched cards; (b) paper tape; (c) plastic disks; (d) edge-punched cards.

__ 12. The rapid advancement in computer technology is most likely the result of which one of the following situations?

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(a) Drop in the supply of competent clerical employees;
(b) Increasing technical knowledge of industrial engineers;
(c) Management's demand for more and better information;
(d) Continued growth of the country's economy.

__ 13. Which one of the following effects is automatic data processing most likely to have on office jobs? (a) changing the nature of office jobs; (b) eliminating office jobs; (c) increasing office jobs; (d) none of the above.

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SUGGESTED TEST ITEMS, Continued

B. True or False and Fill-in

1. Data processing activities will be found wherever business is conducted. T F

2. The recording operation is always the last step in a data processing routine. T F

3. The size of the hole in a punched card determines what coded information the hole represents. T F

4. A punched card usually contains all the necessary information about a single transaction and is called a unit record. T F

5. The first punched card won immediate acceptance from the accounting profession. T F

6. The use of coding systems to represent data is older than written human history. T F

7. The postal ZIP code is an example of alphanumerical coding. T F

8. The Babylonians have left us the earliest known business records. T F

9. Develop a mneumonic abbreviation to classify ten items in your classroom.

   1._____ 2._____ 3._____ 4._____ 5._____

   6._____ 7._____ 8._____ 9._____ 10._____

10. When you code typewriters by brand and by serial number or model, you are performing which operation?_____

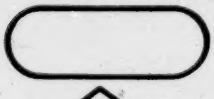
11. When you send a report to interested persons, you are performing which data processing operation? _____

12. In what order are the seven basic data processing operations performed?_____

13. The numbering system using the two symbols "1" and "0" is _____.

14. The binary coded decimal representation for the decimal number 369 is_____.

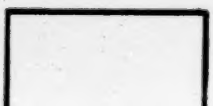
15. Give the commonly accepted name of each of the illustrated flowcharting symbols:



A_____

C_____

B_____



D_____

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II. ESSAY

A. Using at least four flowchart symbols, select one of the procedures listed below and prepare a flowchart which illustrates the various steps necessary to accomplish the job:

1. Changing a tire
2. Taking a test
3. Making a pot of tea
4. Calling a TV repairman

B. Using the following information, plan fields for a punched card system. Identify each field on a card with the appropriate heading and use vertical lines to separate the fields.

1. Date
2. Quantity--from 1 through 999
3. Unit price--from 80¢ to $3.50
4. Amounts--from $1.00 to $999.20
5. Salesman--the company employs 50 salesmen; code by numbers
6. State--code by number

C. Record the following data on the card by marking appropriate columns with pencil fill-in:

1. Date--current
2. Quantity--20
3. Unit price--75¢
4. Amount
5. Salesman--15
6. State--10

D. Explain how a program card would be punched to accomplish the following keypunch job:

Duplicate columns 1-30
Names in columns 31-50
S. S. Number in columns 51-59
Skip columns 60-80

E. Explain the relationship of the weaving industry to the development of computers. What was the significance of the Jacquard card?

F. Automation has been blamed for unemployment for well over 10 years. Is this justified?

G. Choose some business problem such as payroll or student grades to describe the flow of data through a tabulating equipment system in terms of the data processing cycle and basic operations.

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SUGGESTED TEST ITEMS, Continued

H. Choose some business problem such as payroll or student grades to describe and illustrate the flow of data through a computer data processing system in terms of the data processing cycle and basic operations.